# Pacific Gas and Electric Company:

## Recommendations for Appliance Efficiency Regulations


**Presented by: Gary Fernstrom (PG&E) and Alex Chase (Energy Solutions)**

**CEC Efficiency Committee Meeting**

**2008 Rulemaking on Appliance Efficiency Regulations**

**Docket No. 07-AAER-3**

TUESDAY, JANUARY 15, 2008
CALIFORNIA ENERGY COMMISSION
1516 Ninth Street
First Floor, Hearing Room A
Sacramento, California

# PG&E Technical Team

- American Council for an Energy Efficient Economy
- Davis Energy Group
- Energy Solutions
- Ecos Consulting
- LED Consulting
- Lighting Wizards
- Technical Advisor on Lighting Issues-- UC Davis California Lighting Technology Center (CLTC)

# PG&E Title 20 Topics

**PG&E has supported standards options research for at least 29 topics:**

- **Lighting related – 12 topics**
- **Consumer Electronics / Plug load – 7 topics**
- **HVAC / Refrigeration – 3 topics**
- **Other / Miscellaneous – 7 topics**

**Note: All the values in this presentation are current estimates and are subject to change based on updated market data, product testing results and/or consideration of different hypothetical standard levels.**

# PG&E Title 20 – Topic Prioritization

**HIGHEST PRIORITY**

- ? Genral Purpose Lighting
- Televisions, 2,300
- Linear Fluor. Fixtures, 1,959
- Battery Chargers, 1,700
- Set-Top Boxes, 1,072
- Portable Lighting Fixtures, 871
- Decorative String Lighting, 649
- Plug-in Luminous Signs, 585
- Video display equipment, 400
- Metal Halide Lamps, 356
- Pool/Spa refinements

**Support Federal Action**

- Fluor. Tube Lamps, 2,060
- Res. refrigerators, 1,680
- Prem. Efficiency Motors, 769

**HIGH PRIORITY**

- Signage power supply, 341
- Vented Gas Fireplaces, 276
- Microwave Ovens, 200
- Garage door openers, 159
- Nightlights, 111
- Game Consoles

**MEDIUM PRIORITY**

- Residential Air-Handlers
- Illum. st. number signs, 73
- Circulation Pumping, 56
- Shelf lighting systems, 54
- Dimming Ballasts
- Photocontrols
- Comm. Kitchen Vent.

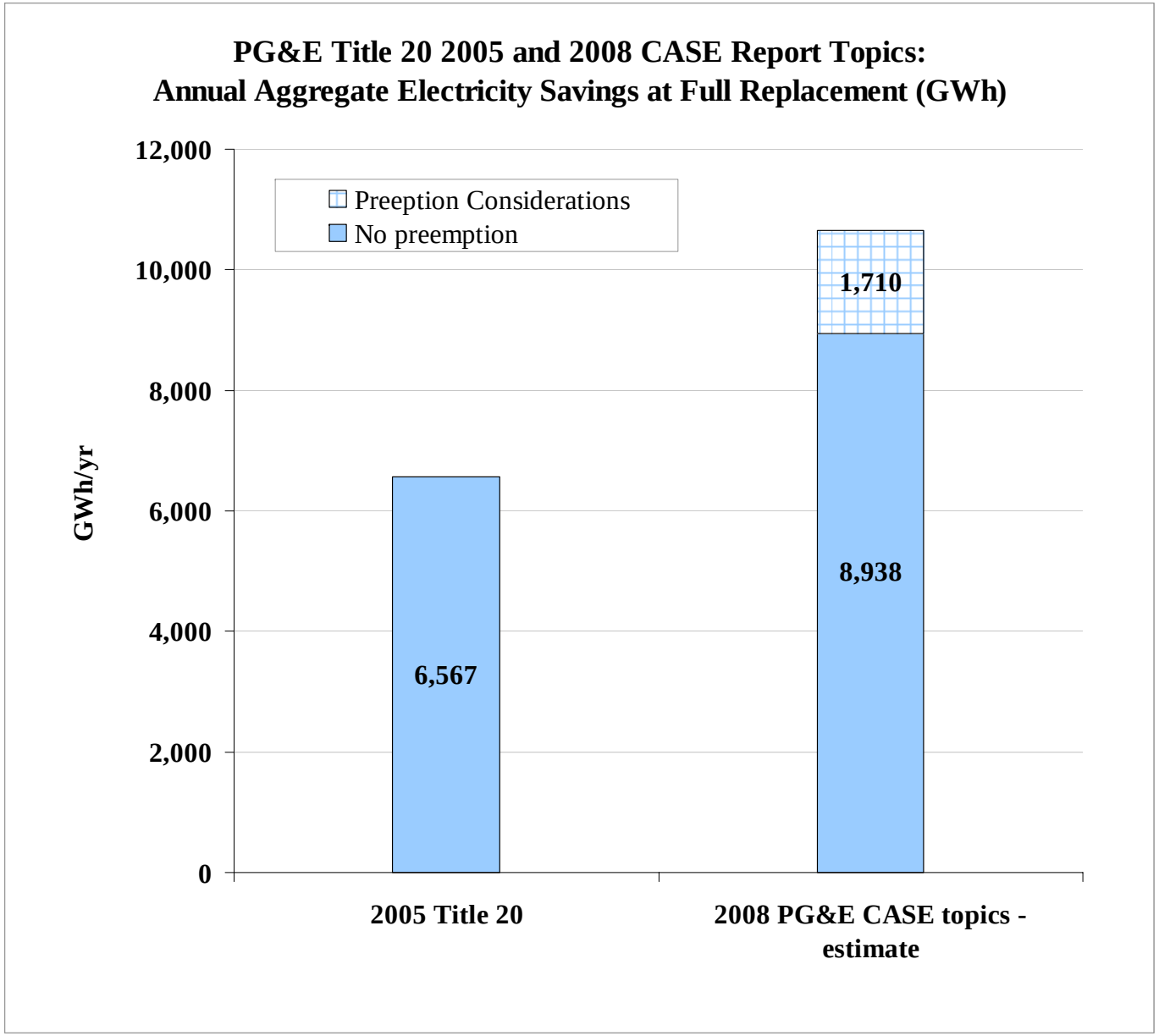
**No further action at this time**

- Modular furniture sensors
- Doorbell transformers

**NOTES:** Values after topic name are current energy saving *estimates* (GWh/yr) for each topic at full replacement (value for vented gas fireplaces is straight GWH equivalents from 9 MMTherms. Topics without values are TBD upon further research.

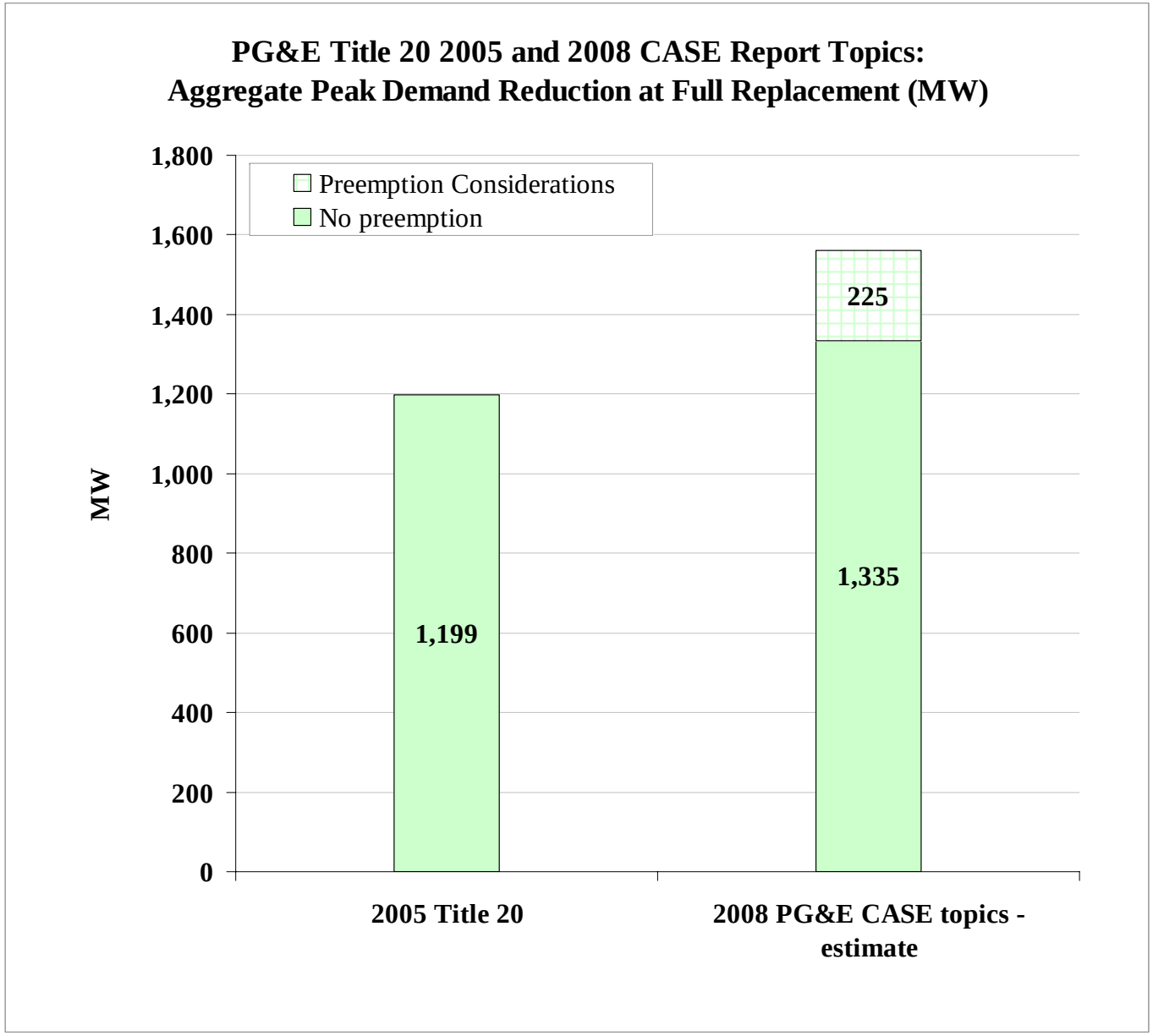
**CIRCLE COLOR KEY:**

- topic related to AB 1109 (Huffman)
- may be related to AB 1109 (Huffman)
- all other topics



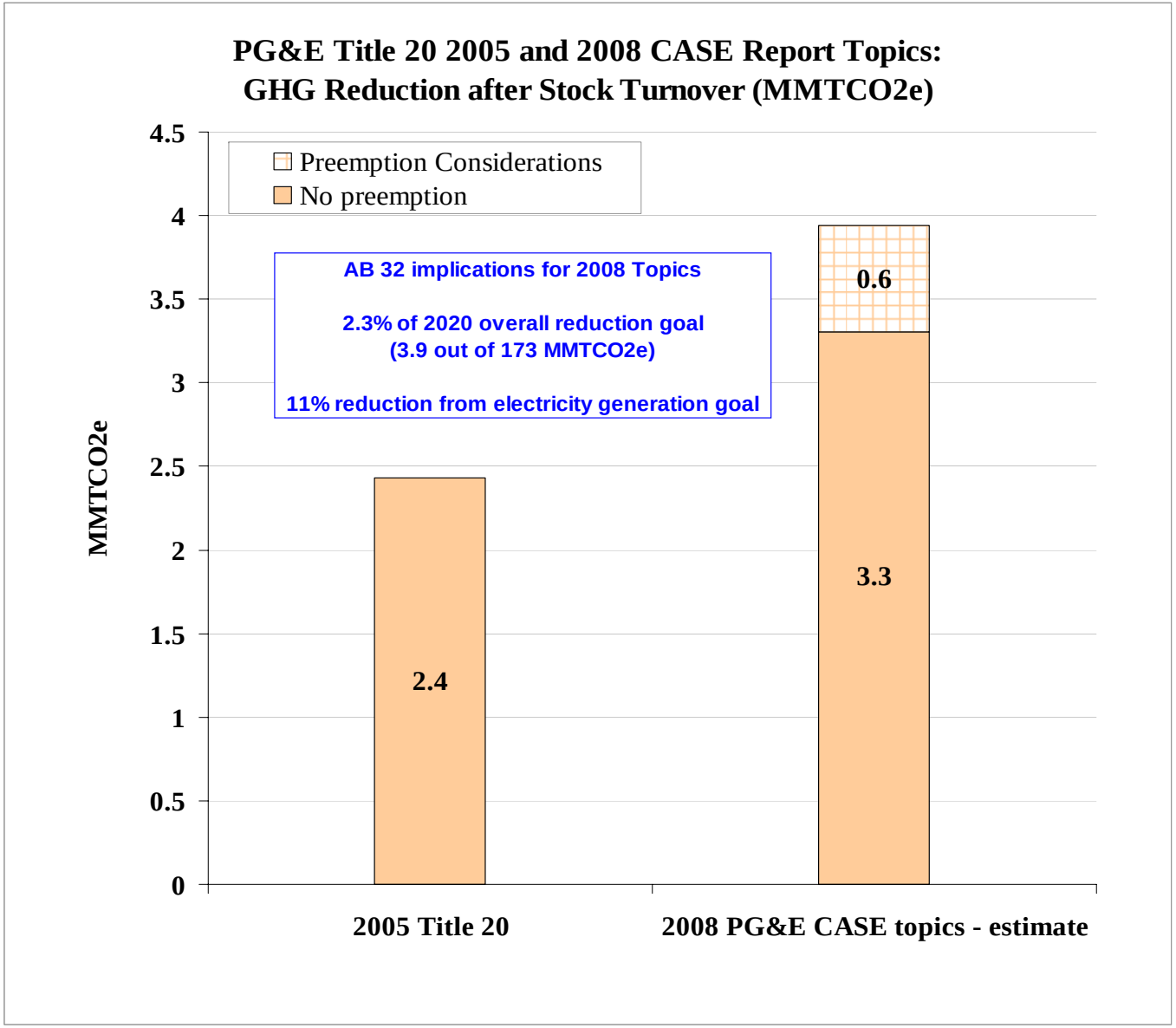



**Note: CA Gross System Power in 2006 was 294,865 GWh (CEC, 2008)**

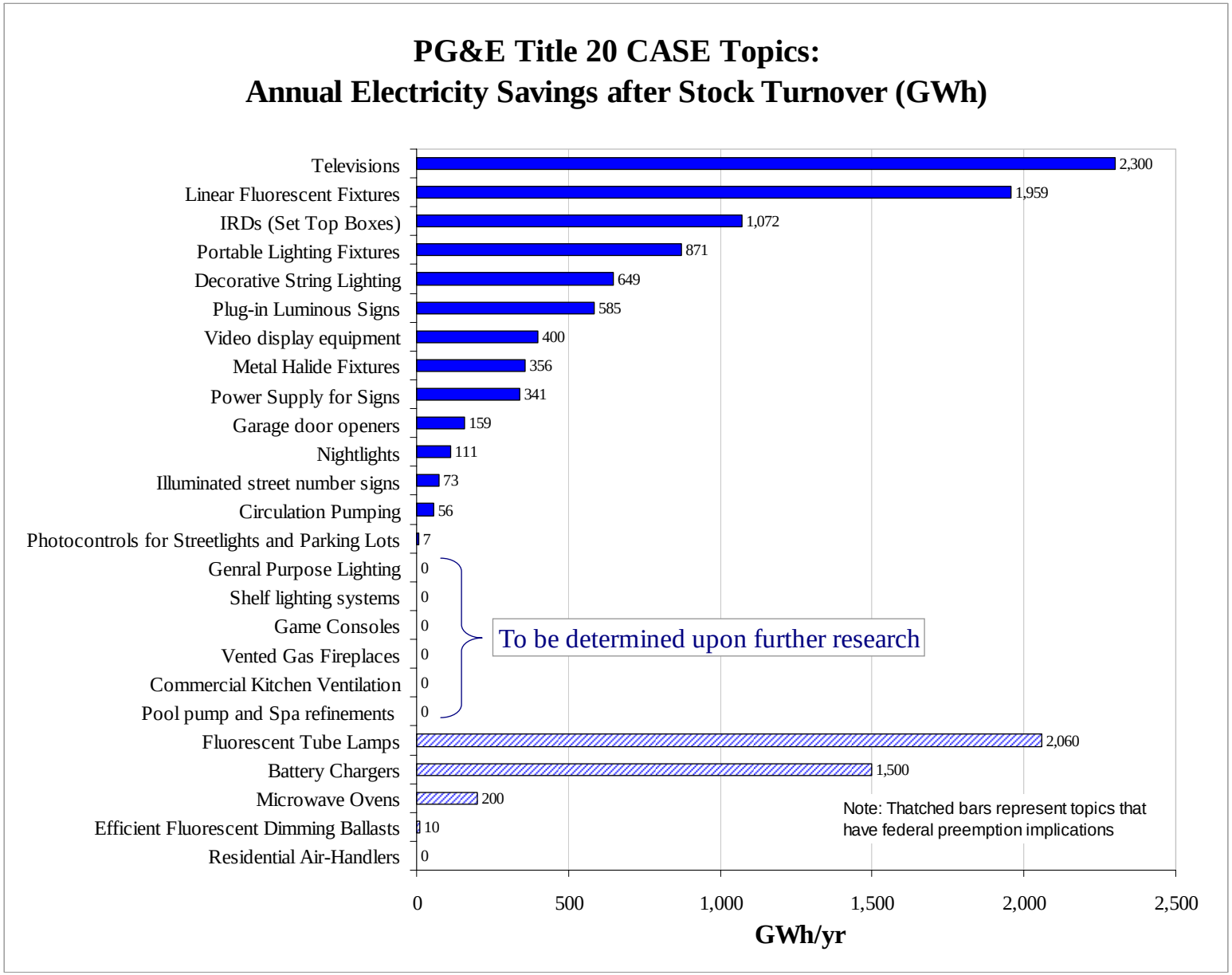




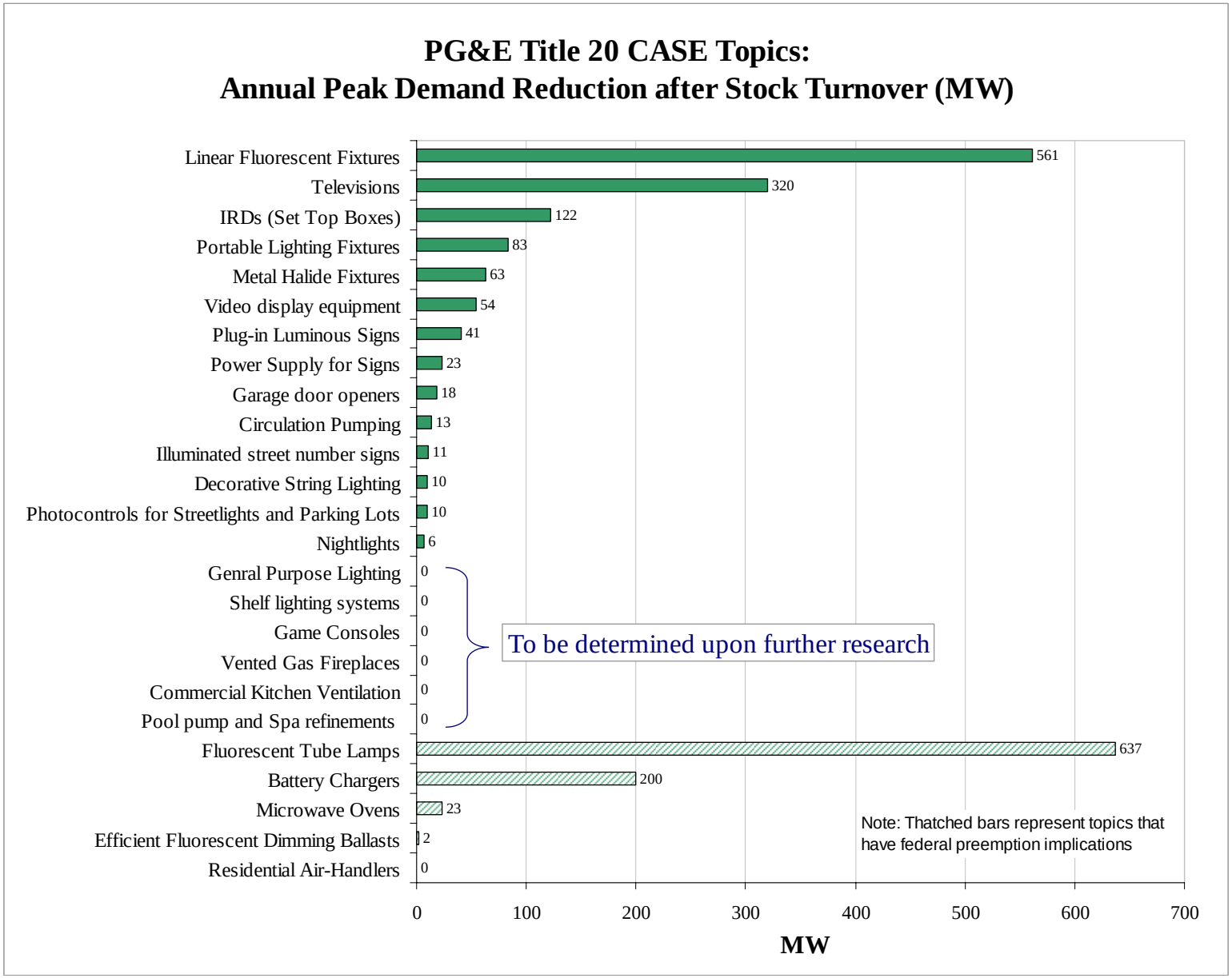

**Note: Forecasted 2008 peak demand in California is 61,751MW (CEC, 2007)**




Note: Based on an avoided ghg emissions factor for CA in 2004 of 0.00037 million metric tons of carbon dioxide equivalent (CO2e) per gigawatt-hour delivered. The CO2e figure includes the six ghg considered by the IPCC to be significant contributors to global climate change. (Source: based on values presented in, *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*. CEC. Dec. 2006). On September 27, 2006, Governor Schwarzenegger signed AB 32, the Global Warming Solutions Act. The Act caps California's greenhouse gas emissions at 1990 levels by 2020.




Note: CA Gross System Power in 2006 was 294,865 GWh (CEC, 2008)






Note: Forecasted 2008 peak demand in California is 61,751MW (CEC, 2007)

# AB 1109 (Huffman) topics

**From AB 1109:**

"On or before December 31, 2008, the commission shall adopt minimum energy efficiency standards for all general purpose lights…the regulations, in combination with other programs and activities affecting lighting use in the state, shall be structured to reduce average statewide electrical energy consumption by not less than 50 percent from the 2007 levels for indoor residential lighting and not less than 25 percent from the 2007 levels for indoor commercial and outdoor lighting by 2018."

PG&E's topics that could help California achieve AB 1109 goals include:

- General Service Lighting (to be discussed this afternoon)
- Linear Fluorescent Fixtures
- Metal Halide Fixtures
- Portable Lighting Fixtures
- Decorative String Lights
- Nightlights
- Shelf Lighting Systems
- Dimming Ballasts
- Illuminated Street Number Signs
- Fluorescent Tube Lamps (supporting at DOE level)

# General Service Lighting

**Proposal Description:** We propose that the CEC adopt general service lighting standards as earliest as permissible by the Federal Energy Bill (Tier 1 levels effective 1/1/11 to 1/1/13 and Tier 2 levels effective January 1, 2018)

From 2007 Federal Energy Bill (pg 222, line7)

"GENERAL SERVICE INCANDESCENT LAMPS

| Rated Lumen Ranges | Maximum Rate Wattage | Minimum Rate Life-time | Effective Date |
|---|---|---|---|
| 1490–2600 | 72 | 1,000 hrs | 1/1/2012 |
| 1050–1489 | 53 | 1,000 hrs | 1/1/2013 |
| 750–1049 | 43 | 1,000 hrs | 1/1/2014 |
| 310–749 | 29 | 1,000 hrs | 1/1/2014 |

"MODIFIED SPECTRUM GENERAL SERVICE INCANDESCENT LAMPS

| Rated Lumen Ranges | Maximum Rate Wattage | Minimum Rate Life-time | Effective Date |
|---|---|---|---|
| 1118–1950 | 72 | 1,000 hrs | 1/1/2012 |
| 788–1117 | 53 | 1,000 hrs | 1/1/2013 |
| 563–787 | 43 | 1,000 hrs | 1/1/2014 |
| 232–562 | 29 | 1,000 hrs | 1/1/2014"; |

**CA can set standards that move effective Tier 1 dates up one year from this figure.** (pg 246, Federal Bill)

**CA can make federal Tier 2 standards effective Jan 1, 2018—two years earlier than anticipated federal schedule** (pg 230, Federal Bill)

***PG&E technical team (Ecos) will present more a detailed presentation on general service lighting in the afternoon session.**

# Linear Fluorescent Fixtures

**Proposal Description:** We propose that new commercial and residential 4-ft and 8-ft fluorescent fixtures meet ballast efficiency requirements. The specified ballast efficiency requirements are simple to establish, reduce ballast losses, and can also reduce the use of inefficient lamps in the new fixture market. The proposal is based on the Ballast Efficacy Factor (BEF) levels in the Consortium for Energy Efficiency (CEE) High-Performance T8 Specification, modified to eliminate potential regulatory loopholes in the spec as it stands and to tighten BEF by 3-6% in key product areas where there has been significant growth in new, more efficient products.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 181.0 | Million |
| Annual sales | 7.2 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 30,992 | GWh/yr |
| Peak demand | 6,219 | MW |
| ***Savings and reduction from proposed standard after stock turnover**** | | |
| Energy savings | 1,959 | GWh/yr |
| Peak demand reduction | 561 | MW |
| ***Costs and Benefits***** | | |
| Lifecycle cost per unit | $3.80 | |
| Lifecycle benefit per unit | $39.64 | |
| Benefit/cost ratio | 10.4 | |

* Savings conservatively assume all fixture sales are 4 feet due to lack of market share data on 8-foot fixtures. Products affected by tightened CEE option also not included in model.

** Average of residential and commercial 4-ft fixtures weighted by sales



**Topic lead: ACEEE**

# Linear Fluorescent Fixtures – Con't

| | |
|---|---|
| **Non-Energy Benefits** | Compatibility with high-performance T8s means increased energy savings, reduced maintenance costs and occupant complaints. Lower ballast losses means reduced air conditioning load: for every 1.0 kWh saved in lighting, one can assume about 0.20 kWh saved from air conditioning. |
| **Acceptance Issues** | None |
| **Federal Preemption or other Regulatory or Legislative Considerations** | None. Fluorescent fixtures are not regulated by the federal government and replacement ballasts can still be sold in California that do not meet the proposed standard. |
| **Other Considerations** | •An additional opportunity is encouraging the use of high-performance T8 lamps in new fixtures, which can increase the savings from this standard 3-fold.<br>•There are two alternative metrics for evaluating ballast efficiency other than BEF: Relative System Efficiency (RSE), developed by LBNL, and "ballast efficiency," being developed by industry. Both need further vetting before being considered. |



**Topic lead: ACEEE**

# Portable Lighting Fixtures

**Proposal Description:** One proposal is that new portable lighting fixtures (such as floor and table lamps) would be limited to a maximum total fixture power draw (e.g., 35 watts). An alternative approach is to require that fixtures meet the Energy Star fixture specification (there is one for CFL and one for LED fixtures), the analysis for which follows. Considering Tiered standard

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock (2006) | 66 | Million |
| Annual sales (average over 2006-2030) | 4.2 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use (2006) | 3,264 | GWh/yr |
| Peak demand (2006) | 310 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings (basecase assumes 50% CFL, 50% HIR) | 871 | GWh/yr |
| Peak demand reduction | 83 | MW |
| ***Costs and Benefits*** | | |
| Lifecycle incremental cost | TBD | |
| Lifecycle benefit | $66 | |
| Benefit/cost ratio | TBD | |



**Topic lead: ACEEE**

# Portable Lighting Fixtures – Con't

| | |
|---|---|
| **Non-Energy Benefits** | Efficient lamps, such as CFLs and LEDs, generally have longer lives than incandescent lamps including halogen IR lamps. |
| **Acceptance Issues** | Not all consumers like CFLs due to color, instant-on and mercury-disposal issues. LED products improving but currently have issues with color, cost and brightness. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | Except for torchieres, portable lighting fixtures are not currently regulated and are not preempted. |
| **Other Considerations** | Current CFLs as low as 9 W meet the 45 LPW threshold but we may want to exempt fixtures that cannot operate if power requirements exceed 8 W. |



**Topic lead: ACEEE**

# Metal Halide Fixtures

**Proposal Description:** We recommend that the current ballast efficiency requirement for MH fixtures be revised to require electronic or equivalent efficiency ballasts. Specifically, we recommend minimum ballast efficiency of 90% for 150 to 300W fixtures and 92% for fixtures of 300W to 500W.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 2.31 | Million |
| Annual sales | 0.25 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 4,000 | GWh/yr |
| Peak demand | 690 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 173 - 538 | GWh/yr |
| Peak demand reduction | 30 - 96 | MW |
| ***Costs and benefits per unit*** | | |
| Lifecycle cost | $146 | |
| Lifecycle benefit | $216 | |
| Benefit/cost ratio | 1.5 | |



**Topic lead: ACEEE**

# Metal Halide Fixtures – Con't

| | |
|---|---|
| **Non-Energy Benefits** | Benefits of electronic ballasts include reduced size, higher power factor, cooler operation, improved lumen maintenance, better color stability, longer lamp life, and improved dimming capability. |
| **Acceptance Issues** | None |
| **Federal Preemption or other Regulatory or Legislative Considerations** | The federal Energy Independence and Security Act of 2007 explicitly excludes California's MH fixture standards from preemption and provides a one-time opportunity for the California Energy Commission to adopt revised standards by January 1, 2011. |
| **Other Considerations** | None |



**Topic lead: ACEEE**

# Decorative String Lights

Similar decorative effects can be achieved with LED and incandescent light sources:

# Decorative String Lights - Con't

**Proposal Description:** We recommend a two-tiered standard approach to achieve energy savings. Tier 1 sets a maximum power use at 0.25 watts per lamp. The standard would require manufacturers to produce low-wattage incandescent or LED type lamps. Tier 2, which would take effect two years later, sets the maximum power use at 0.1 watts per lamp. Under Tier 2, the majority of decorative light strings would be LED.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 40.7 | Million |
| Annual sales | 14.7 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 720 | GWh/yr |
| Peak demand | 12.6 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | Tier 1: 390<br>Tier 2: 259 additional | GWh/yr |
| Peak demand reduction | Tier 1:5.5<br>Tier 2: 4.5 additional | MW |
| ***Costs and Benefits (per lamp)*** | | |
| Lifecycle cost | $0.02 – $0.60 | |
| Lifecycle benefit | $0.07 - $0.80 | |
| Benefit/cost ratio | Varies | |



**Topic lead: Ecos Consulting**

# Decorative String Lights – Con't

| | |
|---|---|
| **Non-Energy Benefits** | LED decorative string lights have other consumer benefits including:<br>•Cool to the touch. Tests run in the Ecos lab demonstrate that incandescent light string lamps often can become 150° Fahrenheit, whereas LED lamps are typically no warmer than 80° Fahrenheit.<br>•Bright color that does not fade over a normal product's lifetime.<br>•Increased durability. LEDs have no filament or glass to break<br>•Long lamp life. LED lamps can last upwards of 100,000 hours (though they become dimmer with age). |
| **Acceptance Issues** | Infrastructure currently exists to accommodate the proposed standard. Low-wattage incandescent lamps are likely to be manufactured in the same facilities as traditional incandescent lamps because they are nearly identical product with different fill gases or filament designs.<br>LED manufacturing is widespread due to the variety of applications using LED technology including: cell phones, stop lights and exit signs. Decorative light strings provide a use for the least expensive LED technologies that were cutting edge a few years ago but are now inadequate for other industries. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | ENERGY STAR ® recently finalized a decorative string light specification and test procedure. |
| **Other Considerations** | Introduction of "warm white" LEDs into this product is likely to aid in expanded customer acceptance. |



**Topic lead: Ecos Consulting**

# Nightlights

**Nightlights may serve one or more of the following functions:**

Wayfinding
(aid in navigation
of a dark space)

Signal (indicate
location of surface,
wall switch, etc.)

Novelty (decoration)

# Nightlights – Con't

**Proposal Description:** We recommend that CA adopt a ≤ 3.0 kWh/yr standard for annual energy use per nightlight, with a 0.5 W maximum limit for standby power. Nightlight designs that currently do not meet this standard could comply through the use of low-power light sources or by reducing the "on" time of high-power light sources with automatic switches. Annual energy use to be calculated from measured power in "on" and "standby" modes and standardized duty cycles based on nightlight switch technology.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 12.6 | Million |
| Annual sales | 1.6 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 130.4 | GWh/yr |
| Peak demand | 9.3 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 111.3 | GWh/yr |
| Peak demand reduction | 6.4 | MW |
| ***Costs and Benefits per unit*** | | |
| Lifecycle cost | $4.10 | |
| Lifecycle benefit | $36.15 | |
| Benefit/cost ratio | 8.9 | |



**Topic lead: Ecos Consulting**

# Nightlights – Con't

| | |
|---|---|
| **Non-Energy Benefits** | •LED and electroluminescent (EL) light sources have long design lives. This reduces replacement costs<br>•Automatic switches (motion detectors and photoswitches) decrease the time a nightlight operates in "on" mode and thereby increase the functional life of the fixture and/or replaceable lamp.<br>•Nightlights with low-power light sources (e.g. LED, EL) are safer than nightlights with traditional incandescent lamps. These low-power sources operate at cooler temperatures than traditional incandescent lamps and do not pose a danger to children from fragile glass lamps. |
| **Acceptance Issues** | Already, packaging for nightlights that use lower-power light sources (EL, LED, and neon) frequently contains information about energy efficiency or energy savings. Many nightlights with automated control mechanisms are also present in the marketplace. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | There are no preemption issues |
| **Other Considerations** | Some nightlights are used to aid in the navigation of dark spaces. The proposed standard is written to allow the higher wattage output models to remain available. However, nightlights that utilize higher output technologies will need to use automatic control mechanisms such as photocells and motion detectors to reduce their annual energy usage and comply with the proposed standard. |

# Shelf Lighting Systems (Indoor Use)

**Observed trend: Use of shelf lighting systems by retailers of "beauty, cosmetics and health" products is increasing. The units appear to be an option shipped with the shelving.**

This example shows a drugstore with five illuminated shelves (vertical), each running 25 linear feet, on both sides of two store aisles. Units appear to be T-8 lamps, ballast type unknown. Shelves are hot to touch!

***5 x (five 4ft-lamps) x 2 x 2 = 100 lamps***
***100 lamps x 34W = at least 3,400W per store***

There are at least 9,000 drugstores in CA. Many drugstores are open 18 to 24 hours per day, every day.

# Shelf Lighting Systems (Indoor Use)

**Proposal Description:** Regulate shelf lighting systems in a manner harmonious with Title 20, Section 1605.3 (n3) Non-Federally-Regulated Appliances, Luminaires, Undercabinet Luminaires. Consider setting the maximum requirements to favor T-5 systems and LEDs. Add a requirement for local controls (ON/OFF switch). Also consider option for bi-level dimming or occupancy sensing.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | ~1 | Million |
| Annual sales | increasing | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 268 | GWh/yr (conservative) |
| Peak demand | 30.7 | MW (conservative) |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 54* | GWh/yr |
| Peak demand reduction | 6* | MW |

*Based on illustrative 20% savings scenario



**Topic lead: LED Consulting**

# Shelf Lighting Systems (Indoor Use)

| | |
|---|---|
| **Non-Energy Benefits** | Reducing local thermal loads should prolong the shelf-life of products and protect consumers from potential burns. Overall it may reduce cooling load for the building. |
| **Acceptance Issues** | Retailers are reluctant to reduce light levels, so education efforts may be needed upstream, targeted at the OEMs who can then pass on accurate information to their customers. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | Not aware of coverage by any under-shelving luminaire federal regulations. |
| **Other Considerations** | Application is very similar to undercabinet lighting, already addressed by Title 20. An amendment to the pertinent section would probably be sufficient to capture savings from this application. LED refrigerator cabinet lighting systems are now in use. |

# Illuminated Address Numbers

**Proposal Description:** We propose efficacy requirements for illuminated address numbers that aim to replace existing incandescent products (on 24 hrs./day in many cases) with LED products with photoswitches.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 2.5 | Million |
| Annual sales | TBD | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 90 | GWh/yr |
| Peak demand | 11 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 73 | GWh/yr |
| Peak demand reduction | 10.5 | MW |



**Topic lead: Ecos Consulting**

# Illuminated Address Numbers – Con't

| | |
|---|---|
| **Non-Energy Benefits** | LED products have much longer design lives than incandescent products. Eliminate need for owner to purchase and replace burnt out lamps. Preliminary evaluation indicates that LED address panels are equally or more visible than incandescent address panels. |
| **Acceptance Issues** | LED address panels are available in high-end and low-end price ranges and designs. They can be powered through the doorbell transformer as most incandescent panels are. In addition, many LED address panels can be successfully powered though small imbedded PV panels. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | There are no preemption issues.<br><br>Illuminated address numbers are mandated by some city and neighborhood codes in CA as a safety precaution to enable ambulances/police to find an address quickly at night. Some codes provide an exception if a porch light is left on all night. |
| **Other Considerations** | LED signs should be readily accepted as they are currently offered in a variety of styles and are easier to maintain than incandescent or fluorescent signs (no replacement lamps). Initial evaluation indicates that they are sufficiently visible and would not jeopardize safety. |

# Dimming Ballasts

**Proposal Description:** Require all dimming ballasts for T8s to meet current performance of more efficient dimming ballasts, which incidentally are not as good as extra efficient non-dimming BF (ballast factor) ballasts. These more efficient dimming ballasts do not appear to cost more than less efficient dimming ballasts.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | TBD | units |
| Annual sales | 25,000 | units |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 120 | GWh/yr |
| Peak demand | 30 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 21 | GWh/yr |
| Peak demand reduction | small | MW |



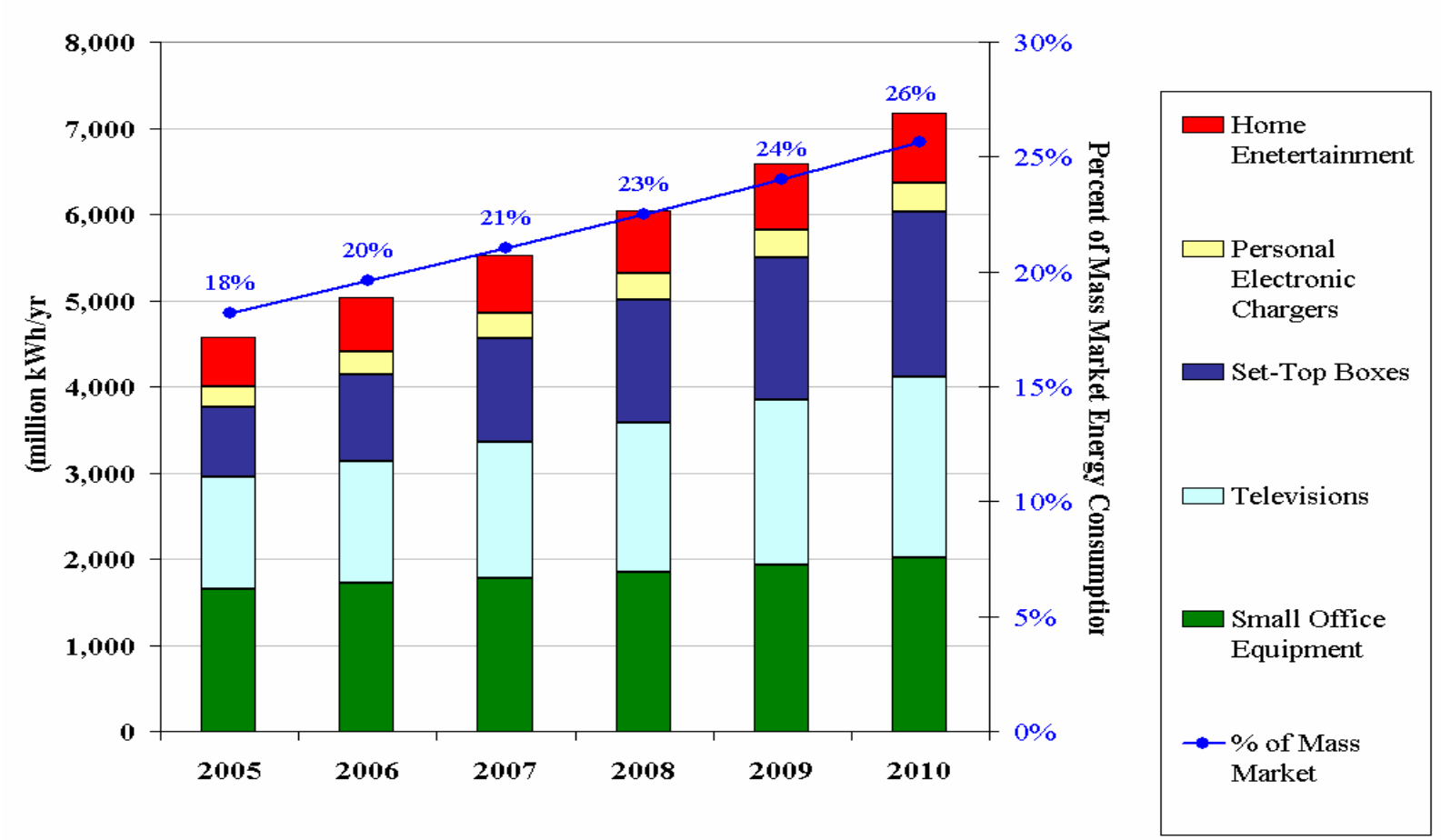
**Topic lead: Lighting Wizards**

# Dimming Ballasts

| | |
|---|---|
| **Non-Energy Benefits** | None |
| **Acceptance Issues** | There appear to be no down-sides to customers with extra efficient dimming ballasts compared to other dimming ballasts. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | There is no federal preemption for new fixtures, although ballasts sold by themselves are preempted. |
| **Other Considerations** | Dimming ballasts for T5s and T5HOs could also be included.<br>Dimming ballasts may not save considerable peak load and KWH cost effectively, compared to high performance fixed BF systems.<br>As dimming fluorescent ballasts dim, they become less efficient, because more energy goes into heating lamp cathodes.<br>The future of dimming will probably be LEDs and/or other solid state lighting |

# Consumer Electronics / Plug Loads:

7 PG&E topics: TVs, Set-top boxes, video display equipment, battery chargers, game consoles, plug-in luminous signs, power supplies for signs




Energy Solutions, 2006

**Figure shows one scenario for consumer electronics load growth in PG&E's Mass Market. Illustrative of rapidly growing segment load growth.**

# Battery Chargers

**Proposal Description:** Set standards for active, maintenance, and no battery modes. Utilize the Battery Charger Systems test procedure developed by Ecos Consulting and EPRI, funded by PG&E and CEC-PIER.

- PG&E and CEC-PIER have supported Ecos Consulting's battery charger research for over four years focusing on:
  - Test method development
  - Stakeholder workshops
  - Battery charger testing
  - Policy recommendations

***PG&E technical team will present a more detailed presentation on battery chargers in the afternoon session.**





**Topic lead: Ecos Consulting**

# Televisions

**Proposal Description:** Set active mode standard for televisions. Savings below are illustrative based on setting standard at proposed Energy Star specification levels (targeted to become effective November 2008)

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 32 | Million |
| Annual sales | 4 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 6,500 | GWh/yr |
| Peak demand | 900 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 2,300 | GWh/yr |
| Peak demand reduction | 320 | MW |
| ***Costs and Benefits*** | | |
| Lifecycle cost | TBD | |
| Lifecycle benefit | $115 | |
| Benefit/cost ratio | TBD | |



**Topic lead: Energy Solutions and Ecos Consulting**

# Digital Set-Top Boxes (IRDs)

**Proposal Description:** Set digital set-top boxes standards to have a maximum standby power level of around 10 watts and to automatically enter standby mode after 4 hours without user input.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 9 | Million |
| Annual sales | 2.3 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 2775 | GWh/yr |
| Peak demand | 317 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 1072 | GWh/yr |
| Peak demand reduction | 122 | MW |
| ***Costs and benefits per unit*** | | |
| Lifecycle cost | $5 | |
| Lifecycle benefit | $42 | |
| Benefit/cost ratio | 8.3 | |



**Topic lead: Davis Energy Group**

# Digital Set-Top Boxes – Con't

| | |
|---|---|
| **Non-Energy Benefits** | none |
| **Acceptance Issues** | Auto power down may require consumer education. Industry worries about impacts on innovation. Ownership concentrated among small number of large market actors, not end-users. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | Currently no DOE standards. |
| **Other Considerations** | Cable and Satellite companies may purchase their set-top boxes out-of-state and lease them to California residents. |



**Topic lead: Davis Energy Group**

# Video Display Equipment

**Proposal Description:** Set active, standby, and off standard for computer monitors and potentially for signage and professional displays. Savings are based on setting standard at current Energy Star specification levels (uses an equation expressed in watts and megapixels). (Note: savings are only shown for computer monitors; values will increase with inclusion of professional displays)

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 28 | Million |
| Annual sales | 7 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 2,600 | GWh/yr |
| Peak demand | 363 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 400 | GWh/yr |
| Peak demand reduction | 54 | MW |
| ***Costs and Benefits*** | | |
| Lifecycle cost | $0 | |
| Lifecycle benefit | $8 | |
| Benefit/cost ratio | Highly Cost-effective | |



**Topic lead: Energy Solutions**

# Video Display Equipment

| | |
|---|---|
| **Non-Energy Benefits** | None |
| **Acceptance Issues** | Minimal. PG&E and SCE are currently running monitor rebate programs for monitors that are 25% or more stringent than the Energy Star specification but appear to provide all the same features and performance levels. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | None |
| **Other Considerations** | CASE report will assess Tiered standards levels (e.g., Tier 1: Energy Star levels in 2010; Tier 2: beyond Energy Star in 2011). Further recommendations and savings potential for non-consumer professional displays (>30") will also be provided to the CEC. Professional display applications include hotels, airports, retail, etc. |



**Topic lead: Energy Solutions**

# Game Consoles

**Proposal Description:** Set auto-power down requirement into standby mode.

- According CEA survey data, 36% of U.S. households owned at least one video game system
- Households owning at least one system have an average of 1.5 systems.
- Active mode power draw is trending upward with newer generation video game systems being sold now due to high definition graphics and internet capabilities.
- Estimated Energy Consumption for California stock is 312 GWh/yr
  - Source: *Energy Consumption by Consumer Electronics in U.S. Residences*, Prepared by TIAX for the Consumer Electronics Association. January 2007

➢ **Significant opportunity for energy savings when consoles drop into standby mode.**

# Plug-In, Luminous Sign Types


**Internally Illuminated Box.** Left to right: incandescent; fluorescent; fluorescent.


**Stanchion (pole).**
Incandescent.


**Exposed light source ("skeleton" or "matrix") text or graphics.**
Left to right: neon; LED; LED.

# Plug-In, Luminous Signs (Indoor Use)

**Proposal Description:** Require all self-contained sign units that plug into 120V AC building mains power and are intended for indoor use to address:

- Input power demand: Establish a maximum W/sf based on the area of the sign face(s). Maximum will vary by sign type (see photos).
- Controls: Integral ON/OFF switch (not a pull-chain). Remote control ON/OFF permitted.
- Controls: For signs with a face area >4sf, a supplemental time-of-operation control, such as a photosensor, timer, or remotely addressable timer.

| | | |
|---|---|---|
| ***California stock and sales (conservative estimates)*** | | |
| Stock | 2.8 | Million units |
| Annual sales | 0.5 | Million units |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 835.2 | GWh/yr |
| Peak demand | 135.7 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 584.6 | GWh/yr *based on 70% savings scenario |
| Peak demand reduction | 40.7 | MW |
| ***Costs and Benefits*** | | |
| Lifecycle cost | Cost half as much as base case units | |
| Lifecycle benefit | 30% -70% Reduced operating costs. Extended design life; no maintenance costs. | |
| Benefit/cost ratio | Benefits outweigh costs. | |



Topic lead: LED Consulting

# Plug-In, Luminous Signs (Indoor Use)

| | |
|---|---|
| **Non-Energy Benefits** | Assuming that most new signs under this proposal use either light emitting diode or other solid-state technologies, then there should be extended design life, no maintenance costs, no mercury and minimal (if any) lead in the signs. End-of-life disposal or recycling should be less burdensome due to lower weight, more benign materials. In cases where neon is replaced with LEDs, the electrical operating requirements are typically low-voltage, reducing fire and electrical shock hazards. |
| **Acceptance Issues** | Signs are ubiquitous for many businesses, and are acquired or changed frequently. The trend is toward increased numbers and use of signs, bolstered by intense marketing by sign retailers, economic development programs and small business advocacy campaigns. Any perceived restrictions on design choices would be regarded negatively by users and retailers of signs. However, the trend in the market is already toward increased use of LEDs in signs. A label could increase purchaser awareness of the energy and environmental benefits of the new products. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | Many local jurisdictions have stringent and quite varied sign regulations; most are focused on outdoor signage. Some local laws do, however, apply to signage in windows. Signs are well-established as a form of free speech and are considered an operational right for businesses. The only federal program presently addressing energy efficiency in signs is in EPACT 2005; it applies only to exit signs. |
| **Other Considerations** | The California and national sign industry associations and representatives are participating in the regulatory process for Title 24, for outdoor signage. There is a relatively high level of awareness and resistance within this industry to any changes perceived as restrictive of free speech or economically burdensome. However, there is a counterbalancing desire in this industry to be "green" and to increase sales and profits, a scenario likely to occur with this proposal. |



**Topic lead: LED Consulting**

# Power Supplies for Luminous Outlines, Text and Channel Letters (Indoor Use)

**Neon outline ("skeleton neon")**


**Channel letters**

**Plug-in signs**



**Power supply ("transformer" for ne "ballast" for fluorescent; "circuit driver" for LED).**

# Power Supplies for Luminous Outlines, Text and Channel Letters (Indoor Use)

Description: Harmonize with Title 24, Section 148, items b3, b5 and b7 (NOT b1, b2, or b4; and, no exceptions).

**"148 (b) Alternate Lighting Sources.** The sign shall comply if it is equipped only with one or more of the following light
sources:
3. Neon or cold cathode lamps with transformer or power supply efficiency greater than or equal to following:

A. A minimum efficiency of 75% when the transformer or power supply rated output current is less than 50 mA, or

B. A minimum efficiency of 68% when the transformer or power supply rated output current is 50 mA or greater, Where the ratio of the output wattage to the input wattage is at 100% tubing load; or

5. Light emitting diodes (LEDs) with a power supply having an efficiency of 80% or greater, or
7. Electronic ballasts with a fundamental output frequency not less than 20 kHz,

**Topic lead: LED Consulting**

# Power Supplies for Luminous Outlines, Text and Channel Letters (Indoor Use)

| | |
|---|---|
| **Non-Energy Benefits** | New power supplies will comply with current electrical and fire safety requirements, presumably reducing the risk of electrical shock and fires for users and building owners. Purchasers of LED-based systems should not need a specially-licensed neon installer, and so would save labor and installation costs relative to purchasers who choose neon. The cost of power supplies for this application should decline as Title 24-stimulated demand for new power supplies increases. |
| **Acceptance Issues** | The trend is toward increased use of luminous outlines and letters, bolstered by intense marketing by sign retailers, economic development programs and small business advocacy campaigns. Any perceived restrictions on design choices would be regarded negatively by users and retailers of signs. However, the trend in the market is already toward increased use of LEDs. A label could increase purchaser awareness of the energy and environmental benefits of the new products. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | Many local jurisdictions have stringent and quite varied sign regulations; most are focused on outdoor signage. Some local laws do, however, apply to signage in windows. Signs are well-established as a form of free speech and are considered an operational right for businesses. The only federal program presently addressing energy efficiency in signs is in EPACT 2005; it applies only to exit signs. |
| **Other Considerations** | The California and national sign industry associations and representatives are participating in the regulatory process for Title 24, for outdoor signage. They are already familiar with those power supply requirements. There is a relatively high level of awareness and resistance within this industry to any changes perceived as restrictive of free speech or economically burdensome. However, there is a counterbalancing desire in this industry to be "green" and to increase sales and profits, a scenario likely to occur with this proposal. |

# Remaining Topics

HVAC / Refrigeration

- Residential Air-Handlers
- Commercial Kitchen Ventilation
- Residential Refrigerators*

Other / Misc.

- Pool and Spa refinements
- Vented gas fireplaces
- Microwave ovens
- Garage door openers
- Circulation pumping
- Photocontrols for streetlights and parking lots
- Premium efficiency motors*
- Fluorescent tube lamps**

***Indicates topics that PG&E successfully impacted federal standards activity**

****Advocating at federal level**

# Pool and Spa Refinements

- Change motor efficiency standard to a performance basis.
- Better accommodate high-efficiency multi-speed motors.
- Add booster pumps and motors.
- Address efficiency of 48-Frame above ground products.
- Readdress time switch requirements to clarify what is meant by a "normal cycle" and "default speed" as it relates to multi-speed products.
- Incorporate the refinements to the spa test procedure as developed by APSP and Cal Poly.
- Address the friction loss of certain hydraulic components such as backwash valves and solar thermal pool heating panels.
- Test and list for the efficiency of automatic pool cleaning systems.
- **PG&E has been actively engaged with the pool and spa industry and expects the recommendations to non-controversial, consensus agreements**



**Topic lead: Davis Energy Group**

# Vented Gas Fireplaces

**Proposal Description:** Require testing and listing of Vented Gas Fireplaces to the test method CSA-P4.1. Require Vented Gas Fireplaces to have a minimum Fireplace Efficiency of 0.55 as measured by CSA-P4.1.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 2.3 | Million |
| Annual sales | 0.2 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 72 | Million therms |
| Peak demand | 0 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 8 | Million therms |
| Peak demand | 0 | MW |



**Topic lead: Davis Energy Group**

# Microwave Ovens

**Proposal Description:** Require microwave ovens to have a maximum standby power level of 1 watt.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 11.5 | Million |
| Annual sales | 1.7 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 1484 | GWh/yr |
| Peak demand | 169 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 200 | GWh/yr |
| Peak demand reduction | 23 | MW |
| ***Costs and Benefits*** | | |
| Lifecycle cost | $0.30 | |
| Lifecycle benefit | $16 | |
| Benefit/cost ratio | 52.7 | |



**Topic lead: Davis Energy Group**

# Microwave Ovens – Con't

| | |
|---|---|
| **Non-Energy Benefits** | None. |
| **Acceptance Issues** | Consumers who desire a bright display must enable it if the product complies only with it off or dim. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | DOE rulemaking on Kitchen Ranges and Ovens, and Microwave Ovens is currently in process. Current Microwave test procedure does not include standby power. |
| **Other Considerations** | Consider allowing manufacturers to use higher wattage displays if they ship the products with the display disabled or set it to low intensity. |



**Topic lead: Davis Energy Group**

# Garage Door Openers

**Proposal Description:** Require Garage Door Openers to have a maximum standby power level of 1 watt.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 5.2 | Million |
| Annual sales | 0.6 | Million |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 204 | GWh/yr |
| Peak demand | 23 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | |
| Energy savings | 159 | GWh/yr |
| Peak demand reduction | 18 | MW |
| ***Costs and Benefits*** | | |
| Lifecycle cost | $0.30 | |
| Lifecycle benefit | $30 | |
| Benefit/cost ratio | 100.6 | |



**Topic lead: Davis Energy Group**

# Efficient Exhaust Fans for Food Service Applications

**Proposal Description:** Develop a cfm/watt standard or other standard (e.g. minimum motor efficiency) for exhaust fan and motor combinations used in food service applications. Consider expanding scope to include all fractional HP motors not covered by the current DOE rulemaking on fractional HP motors.

| | | |
|---|---|---|
| ***California stock and sales*** | | |
| Stock | 100,000 | units |
| Annual sales | 2,000 | units |
| ***Current energy use and peak demand in California*** | | |
| Energy use | 120 | GWh/yr |
| Peak demand | 30 | MW |



**Topic lead: Energy Solutions**

# Efficient Exhaust Fans for Food Service Applications– Con't

| | |
|---|---|
| **Non-Energy Benefits** | Premium efficiency fan motors may prolong equipment life. |
| **Acceptance Issues** | Proposed standard would require a test and list procedure to determine the relative efficiency of the exhaust fans. A labeling system would assist in the adoption of more efficient exhaust fans. |
| **Federal Preemption or other Regulatory or Legislative Considerations** | This standards proposal does not appear to be subject to federal preemption. |
| **Other Considerations** | An alternative approach would be to focus efforts on the small motors that are not covered by the current DOE proposed small motors standards. These non-convered motors would include certain single phase motors including split phase and shaded pole motors. This would broaden the CASE report to include many other motor types but would also cover commercial kitchen exhaust fans. |

# Circulation Pumping

**Proposal Description:** Require minimum efficiency levels for Aquarium and Pond circulation pumps. Consider expanding scope to include all fractional HP motors not covered by the current DOE rulemaking on fractional HP motors.

| ***California stock and sales*** | ***Aquariums*** | ***Ponds*** | |
|---|---|---|---|
| Stock | 0.9 | 0.8 | Million |
| Annual sales | 0.1 | 0.1 | Million |
| ***Current energy use and peak demand in California*** | | | |
| Energy use | 295 | 996 | GWh/yr |
| Peak demand | 34 | 114 | MW |
| ***Savings and reduction from proposed standard after stock turnover*** | | | |
| Energy savings | 44 | 100 | GWh/yr |
| Peak demand reduction | 5 | 11 | MW |
| ***Costs and Benefits*** | | | |
| Lifecycle cost | $3 | $10 | |
| Lifecycle benefit | $28 | $130 | |
| Benefit/cost ratio | 9.3 | 13.0 | |



**Topic lead: Davis Energy Group**

# Additional Topics

- **Photocontrols for Roadway and Parking Lot Lighting:** Explore requiring photocontrol performance that provides reliable on/off performance (ratio), reduces drift, and lowers standby power.

  **Topic lead: Energy Solutions**

- **Residential Air-Handlers:** Establish test and list and considering setting cfm/watt limits to require better combination of fans, motors, equipment aerodynamics. Current draft CASE report recommends a test and list requirement for on power required at three different external static pressure levels.

  **Topic lead: ACEEE**

# PG&E Title 20 – Topic Prioritization

**HIGHEST PRIORITY**

- ? Genral Purpose Lighting
- Televisions, 2,300
- Linear Fluor. Fixtures, 1,959
- Battery Chargers, 1,700
- Set-Top Boxes, 1,072
- Portable Lighting Fixtures, 871
- Decorative String Lighting, 649
- Plug-in Luminous Signs, 585
- Video display equipment, 400
- Metal Halide Lamps, 356
- Pool/Spa refinements

**Support Federal Action**

- Fluor. Tube Lamps, 2,060
- Res. refrigerators, 1,680
- Prem. Efficiency Motors, 769

**HIGH PRIORITY**

- Signage power supply, 341
- Vented Gas Fireplaces, 276
- Microwave Ovens, 200
- Garage door openers, 159
- Nightlights, 111
- Game Consoles

**MEDIUM PRIORITY**

- Residential Air-Handlers
- Illum. st. number signs, 73
- Circulation Pumping, 56
- Shelf lighting systems, 54
- Dimming Ballasts
- Photocontrols
- Comm. Kitchen Vent.

**No further action at this time**

- Modular furniture sensors
- Doorbell transformers

**NOTES:** Values after topic name are current energy saving *estimates* (GWh/yr) for each topic at full replacement (value for vented gas fireplaces is straight GWH equivalents from 9 MMTherms. Topics without values are TBD upon further research.

**CIRCLE COLOR KEY:**

- topic related to AB 1109 (Huffman)
- may be related to AB 1109 (Huffman)
- all other topics

# Consideration for CEC Title 20 Phasing

- Recommended that the first phase includes at the minimum:
  - General service lighting – moving federal Tier 1 levels up one year and Tier 2 levels up to Jan. 1, 2018
  - Key lighting topics related to AB 1109 (Huffman)
  - Battery chargers
  - Metal Halide Ballasts
  - Walk-in coolers (Edison lead)

- Other timing factors
  - TVs and set-top boxes: new Energy Star specification becomes effective late 2008
  - Long lived measures with large aggregate savings should be prioritized in the phasing plan. Otherwise their full benefits may not accrue by 2020, the AB32 end, because a large proportion of stock turn over will not have occurred.

# Concluding Comments

- PG&E and the other IOUs are available to assist the CEC

- PG&E can specifically offer the following:
  - Staff and technical team resources
  - Market research and product testing
  - Run targeted programs in preparation for upcoming standards
  - Convene stakeholder workshops and meetings

- We note the importance of engaging all key stakeholders early in the rulemaking process

- We recommend that CEC establish more definitive expectations for stakeholder intervention, including:
  - Assertions must be documented on a timely basis
  - Stakeholders that sit on the sidelines until the last minute should not be given undue consideration

# Concluding Comments

- The savings opportunity is large and must be pursued to the greatest extent possible in view of the challenging AB32 goals
  - Historically, Title 20 accounts for one quarter of the impacts of voluntary programs and codes and standards in CA.
  - Title 20 standards are the cheapest, most impactful tool for reaching electric generation portion of the AB32 goals
  - As currently modeled, however, the Title 20 proposal represents only ~11% of the needed impact and subsequent rounds of Title 20 will be too late to have significant incremental impacts by 2020.
  - Given the costs and challenges faced in scaling up other energy efficiency strategies, Title 20 needs to achieve more--not less--than the impacts implicit in the initial proposals you hear today from stakeholders.